



# Mineta Transportation Institute

Founded in 1991, the Mineta Transportation Institute (MTI), an organized research and training unit in partnership with the Lucas College and Graduate School of Business at San José State University (SJSU), increases mobility for all by improving the safety, efficiency, accessibility, and convenience of our nation's transportation system. Through research, education, workforce development, and technology transfer, we help create a connected world. MTI leads the [Mineta Consortium for Transportation Mobility](#) (MCTM) funded by the U.S. Department of Transportation and the [California State University Transportation Consortium](#) (CSUTC) funded by the State of California through Senate Bill 1. MTI focuses on three primary responsibilities:

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Report 21-31

# The Fresno State Transportation Challenge

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# Executive Summary

The Fresno State Transportation Challenge uses an action civics approach to support K-12 students in developing transportation-related projects that have a positive impact on the community. In 2020 the goal was to expand, refine, and create structures to sustain the implementation of the Transportation Challenge across subsequent years. As a result of the COVID pandemic, the process and goals of the project were adapted. The project was extended into April 2021 and was entirely conducted through remote participation. The focus was on two high schools. The expansion into the high school age bracket was successful and the experience with these two projects will allow for easier expansion in additional high schools in the future. One high school focused on the topic of active mobility, specifically biking, and addressed the challenge of how to get more students to bike to school. The other high school combined the transportation challenge with an economic vitalization project. The students were asked to also develop a modern transportation concept. Both projects exposed high school students to the topic of transportation and expanded awareness of transportation careers. Students also developed important competencies in the domains of problem solving, collaboration, communication, and leadership.

# 1. Introduction

The Southwest Transportation Workforce Center (SWTWC) has identified a particular need for workforce development in the transportation industry. The *National Transportation Career Pathways Final Report* highlights, “the fundamental lack of engagement at the K–12 and community college level unnecessarily restricts awareness and access to these professional careers” (SWTWC , 2019). If trends from other areas in education hold up, it is likely that this lack of engagement is further exacerbated for underserved students. Unfortunately, not all youth have the same exposure to a wide diversity of career paths or opportunities to engage in high-quality learning experiences. Such experiences are important when individuals develop the self-efficacy to achieve academically, pursue demanding careers, and have positive impacts as citizens.

In order to increase the awareness and exposure to transportation related careers the Fresno State Transportation Institute (FSTI) in 2019 has supported the development and piloting of an authentic civic learning experience for K–8 students: Youth Designing the Future of Transportation. During this experience, students identified a transportation related issue in their community, designed a solution, shared it with their community, and advocated for its application. During the spring, summer, and fall of 2019 the FSTI supported three cycles of the Transportation Challenge: an 8-week process in an after-school setting during the normal school year, an intense 3-week process during summer school, and an 8–10-week process during classroom instructional time during the normal school year. The Transportation Challenge can teach K–8 students about transportation and transportation related careers, and get them to apply this knowledge in addressing a transportation related issue in their community (Wandeler, Hart, and Mercado, 2019). Students reported that they learned about transportation, thought more about transportation related issues, and transportation related careers. Students also developed their knowledge about the profession of transportation engineering, and developed their interest in pursuing higher education opportunities. The university engineering students, who supported the K–8 students in their work on the projects, had a positive influence on the young students’ learning. The engineering students connected very well with the students, and served as role models. At the same time, the university students appreciated the opportunity to be able to interact with younger students and engage in meaningful learning. The pedagogical approaches of action civics and agile learning that frame the Transportation Challenge were also found to be influential for the K–8 students’ learning. The students reported that they had a chance to be creative and work on meaningful projects to improve their community, as well as learn how to collaborate better, work in a team, develop their critical thinking, and overcome challenges when working on the project.

The goal of the *Fresno State Transportation Challenge 2020* was to again create an authentic civic service learning experience, in which K–12 students and teachers, university students and professors, and community members, work together on projects addressing transportation concerns and related issues in the region. The goal was to expand, refine, and create structures to sustain the implementation of the *Transportation Challenge* across subsequent years and expand into high schools.

## The Process of the Fresno State Transportation Challenge

The process of the Fresno State Transportation Challenge is based in the interaction between the K-12 students, the university engineering students and faculty, who support the K-12 students and their teachers in their work on the projects. The culminating outcome is ideally a community showcase, where students present their work to the public. Because of COVID, the showcase was adjusted and it resulted in a virtual presentation between different student teams

The 2020 edition of the FSTC involved university faculty, university students, high school (9–12) teachers and students, and community members. The authors focused on three innovative pedagogical approaches. First, they used an action civics pedagogy for setting the broader context of the project. The action civics pedagogy is rooted in service-learning, civic advocacy, and youth participatory action. Projects are framed in a format that encourages youth to consider themselves as active citizens who can make a positive impact on their community and society in general. Second, they used a design/engineering thinking process. Design thinking and engineering thinking are systematic processes used in industry to develop solutions, with the goal to create innovative, user-friendly products and services. The key phases of these processes are: identifying a problem, researching, empathizing with users, ideating, prototyping, testing, and improving. The students thus learned through this process to identify the needs of the community, and then develop, test and improve solutions. Third, they used agile learning methods as a pedagogy, to facilitate the organization of the project. Agile learning is a highly adaptive method, where the facilitators from the university adjust the content and rhythm of the interaction depending on the feedback from the students and teachers. The goal is to provide a structure in which there is a high flexibility. Here is an overview of the structure:

Phase 0. Explore what is transportation and modes of transportation. For example, how do students get to school?

Phase 1. Identify the problem and presentation of challenges. Example: how many walk? Conduct a walkability audit, conduct a safety audit.

Phase 2. Explore, research and ideate solutions: what can we do? Design and create: what have others done? How can it be solved?

Phase 3. Design and create solutions, then test and improve.

Phase 4. Action: present and exchange with others resulting in civic action.

The method also made it possible for each teacher to facilitate multiple small teams, and thus create an environment where students experience autonomy and responsibility to work on a project that interests them and engage fully in the project.

## The Fresno State Transportation Challenge in Times of COVID

The Fresno State Transportation Challenge uses an action civics approach to guide students to develop transportation related projects that have a positive impact on the community. The culminating outcome is a community showcase, where students present their work to the public. The Transportation Challenge was in person in 2019 and was supposed to be in person in 2020 as well, however, because of COVID-19 we got delayed.

The main challenges we dealt with during COVID was that we were moved to the online space, which in itself was not a considerable issue. The bigger challenge was that the schools and teachers were overwhelmed with the changing demands, and projects such as ours were the first ones to be cancelled. Then once we recruited another batch of teachers, the main school district we were collaborating with, announced that they would return to physical school, which again lead to a shift in priorities. Nevertheless, we managed to conduct high quality projects in two different high schools.

## 2. Methods

### Participants

The students that participated in the project came from two urban high schools (identified as R and P for the remainder of the report) in the Central Valley in California. Both schools had a very high percentage of underserved student, based on 2018–19 data from the College Board. The total sample size from high school R was 58 students. The total minority enrollment at R was 97%, and 91% are economically disadvantaged. Mathematics proficiency is at 10% and Reading proficiency at 38% (College Board, 2019a). The total sample size from high school P was 25 students. The total minority enrollment at P is 80%, and 81% of students are economically disadvantaged (College Board, 2019b).

### Research Design

The authors' research design consisted of an *illustrative case study* approach. In this case the collaboration projects with the two high schools are described in more detail. The data sources are notes from preparation of sessions, notes from the actual sessions with the students, interviews with teachers, interviews with students, and the work of the students such as research, discussions, drafts, and final presentations.

### 3. Results

First, we present two overall summaries of the projects, and highlight some of the key practices and new insights from this challenge. Then we will provide an overview of the insights about the impact of the project based on the interviews with teachers and students.

#### Case Study 1: Transportation Challenge at High School R

In high school R the project essentially followed the planned format. The process spanned eight weeks, with weekly one hour-long instructional blocks (shown in table 1). The process began with a kick off session with an expert speaker from the community creating a meaningful case for learning, building students’ knowledge about transportation related topics. Then, students brainstormed topics and identified transportation related issues in their community. Next, students conducted research and designed a survey to question their school community about issues around biking to school. This step was again complemented by a guest speaker from the community. This particular guest speaker developed the active transportation concept for the headquarters of Apple in Cupertino. Afterwards, students ideated and designed an action plan to propose solutions. Students then developed a presentation about their research, solution and action plan. In a virtual showcase the students received feedback from university students and faculty. Lastly, the students came up with an action; an organized a bike to school day after the end of the project.

Table 1. Sample Schedule

Date	Activity	Participants
2-22 Monday	SESSION 1: Laying the groundwork, establish relationship, Identify Issue	ALL EXPERT Laura
3-1 Week of NOT Monday	SESSION 2: Understanding the issue - Research, root causes, community	By class Teacher
3-8 Monday	SESSION 3: Design - Develop an iterate - a prototype, present and get feedback	ALL EXPERT (APPLE bike guru)
3-15 Week of NOT Monday	SESSION 4: Improve - improve prototype, present and get feedback	By class
3-22	SESSION 5: Improve - improve prototype, present and get feedback	By class
3-29 Spring break		
4-5 Monday	SESSION 6: Improve - improve prototype, present and get feedback	By class
4-12 Monday	SESSION 7: Prepare showcase	By class
4-19 Monday	SESSION 8: Showcase, Share with other students, (ideally with community, city council, faculty)	ALL
5-21 Friday	Bike to School Day	Whole School, Community

## Case Study 2: Integration of the Transportation Challenge at High School P

In high school P the project followed an innovative new format and was integrated in an existing project-based learning experience. At high school P students were engaged in an economic revitalization project. For the transportation challenge the students were asked to additionally develop a modern transportation concept. The students participated in lessons about the future of transportation and were then supported by University students to apply the learnings of these lessons to their revitalization projects. The teams would design a virtual model of the city area and propose how transportation could be redesigned. The students not only changed the layout of their redesign but also thought about the potential impact on the local economy and alternative business models. For example, one team discussed the combination of different transportation modes: electric buses would bring people from more distant areas to the vitalized area, and then once in the area people could use an electric scooter rental program to navigate around the revitalized area. Similarly, a team who had proposed a new sports stadium reflected on parking needs and develop an alternative transportation concept to mitigate the parking needs that would come with a predominant use of cars. A different team created a pedestrian zone where people could walk and bike. They proposed a bike rental program. They also developed new business models and created “bike drive-thrus” for fast food restaurants in the area.

### Impact of the Project

Based on the analysis of interviews with students, teachers, and community partners there were various themes that emerged and illustrate the impact of the project.

For the impact on students the following themes emerged: Perception of Transportation Related Careers, Engagement and Initiative, Problem Solving Skills, Self-efficacy and Hope, Research and Data Analysis, Collaboration and Communication Skills, Leadership Skills

Other themes that emerged to describe the broader impact were: Sustainability of Transportation Related Instruction, Personal Impact on Teachers, Community Integration in the Transportation Challenge, Creating a High-Quality Learning Experience During COVID

In the following section the themes are described and supported by quotes from teachers, students, and community members.

### Impact on the Students: Perception of Transportation Related Careers

The interactions with the project itself, University students, and particularly speakers with transportation related professions can have a meaningful impact on the awareness of students about transportation related careers. Evidence of students’ broadened awareness of transportation related careers was reflected in statements such as these:

“I mean we definitely got a better perspective what career opportunities there are. You know we connected to a lot of different individuals in business at a university level and we got a taste of a little bit of community organizing and being leaders.”

The students also indicate how they are typically not exposed to transportation related career options. They connect it to their broader motivation for meaningful careers where they can have an impact on societal challenges such as climate change. This can serve as an important insight:

when exposing students to transportation related careers one should search for the connection to a purpose and interest that students identify with. This seemed to also increase their interest in inquiring further about career options.

“We definitely became more aware of the transportation related careers. Students aren't exposed to that sort of career options and career education in school a lot of the times. Especially when it has to do with those type of careers. It definitely introduced us to what type of careers are out there for students in active transportation and in sustainability because as we're part of the ecology club that's something we're passionate about. We're passionate about the plan, about climate change. We're passionate about creating a sustainable world. So being able to know what type of careers and all the different facets of those careers and all of the different ways we can contribute to helping solve climate change is really important.”

### Impact on the Students: Engagement and Initiative

The potential of increased student engagement through the transportation challenge was once again highlighted. A teacher pointed out the students' engagement and the importance to give them an opportunity to take initiative.

“Many students kept showing up so they were definitely engaged you know they wanted to be part of the solution which I think is what is very important to give young people ... a path forward.”

“It was fun to see the students run with it. They wanted to be part of the project.”

### Impact on the Students: Self-efficacy and Hope

The students described how working on a problem in this project actually encouraged them during the COVID times. They are describing how identifying problems, developing solutions, and taking action is encouraging and they describe experiencing self-efficacy, agency and also a sense of hope to develop plans, and that they can take action and seeing themselves as part of the bigger environment and community.

“I think it is something that can really bring someone down, because of all of the negative things happening. But I also think that when you're working on a project like this and you're identifying problems. But also identifying solutions um it's really encouraging that you know if you just put your mind to it and you take action that is possible.”

“We really had to step up ... and not only create ideas... and come up with solutions and to execute those ideas, because I think Mr G does a very good job of encouraging us to use our voices and encouraging us to have plans of action. But that's also something that creates independence within students to be able to hold yourself responsible for being part of that environment.”

### Impact on the Students: Problem Solving Skills, Research and Data Analysis

The structure of the transportation challenge puts a big emphasis on students researching an issue, collecting data, analyzing the data and then problem solve to come up with solutions and actions.

A teacher commented:

“And not just what's the problem but where we can go with it and I think that they were probably pretty empowered to apply you know data and understanding of problems towards solutions all throughout their life.”

This teacher also pointed out the transferability of these learnings.

“I really hope that they fix some bigger problems than just this one that we were working on this semester.”

“At the beginning I remember like we had a discussion around the solutions and then we had to try to figure out which ones would actually work for our community and through collecting data I think that really helped and having them really know what avenues to tackle. What was within our area? What we had an effect on ... in terms of transportation and mobility?”

“Researching things like understanding how much more better for an environment using bicycles and things are and just like I never knew how far the distance I was from school. And like knowing that it's not that far in general. So definitely like knowing the distance and getting like more comfortable with traveling on bikes or you know anything any type of transportation like that. Seeing how that's actually doable it's pretty cool.”

### Impact on the Students: Collaboration and Communication Skills

There was also substantial evidence that the transportation challenge puts a big emphasis on students collaborating and communicating with each other. The fact that different teams were created fosters opportunities for collaboration.

“I think this project was very important as it was so collaborative. We really had to step up and be the one to not only create and be able to create ideas and be able to you know speak and communicate those ideas and also come up with solutions and to execute those ideas, because I think Mr G does a very good job of encouraging us to use our voices and encouraging us to have plans of action. But that's also something that creates independence within students to be able to hold yourself responsible for being part of that environment.”

### Impact on the Students: Leadership Skills

There was also substantial evidence that the transportation challenge provides opportunities to develop leadership skills, take civic action and advocate. This teacher made the following observation in regards to leadership skills development:

“Leadership is a skill that's you know really hard to develop and you know once you have that you have it and so I think for sure all these kids are going to go off and you know make a big difference. I don't know if it's specific to active transportation but it definitely lit the fire for several of these kids.”

### Sustainability of Transportation Related Instruction

One goal of the transportation challenge is to raise the awareness of teachers of the topic of transportation and transportation related careers in a way that it is not just a one-time event, but that it is sustainable. One teacher expressed the continuity and motivation for future plans:

“Our bike to school day kind of came very quickly out of this project. I think less than a month ago that was not on the table and so I was pretty impressed how quickly it came together and how much fun people are having here. I would definitely want to do it again each year or each semester. I think we can only grow this event going forward that's good particularly considering it was started during COVID.”

## Personal Impact on Teachers

There was also evidence of a personal impact of the project on teachers. For example, teachers changed their own perception of active transportation and these personal insights likely manifest themselves in their future instruction and work with students.

“For me personally I looked at biking as a way to entertain my kids. As a child myself it was a lot of fun. And the more I went through it (the project), I realized how biking can be for everybody. It can be a solution to lots of issues that are affecting our communities and so it definitely impacted me personally and it gave me a little more empowerment to share this idea with our kids. I think we had a lot of kids involved and I hope to continue that going forward in the years.”

## Community Integration in the Transportation Challenge

In high school R the project connected to two community speakers, one from a local NGO and the other a developer of transportation concepts. In high school P the project connected to community issues by focusing on a problem that is relevant to various organizations in the community: economic revitalization.

The following teacher really appreciated the interdisciplinary nature of the project and the collaboration of the schools, community partners and the Fresno State Transportation Institute.

“It was fun working with Fresno State, it was fun working with our community partners and it was really fun seeing the kids collect the data generate some ideas and run with.”

The connection to the community is particularly relevant to the action civics pedagogy, to ensure that the students experience agency and that they can make an impact through their project and potentially further through a transportation related career.

The community member from a local NGO experienced the impact on students as follows:

“I think it's crucial to get the students involved and get the students to be leaders on their own project in their own neighborhoods in their own schools. One thing that I could see is that they really like to take the leadership and come up with great ideas.”

She also recognized the high degree of student engagement and student leadership.

“When you worked with High School R you could really see that by the students driving the process it became very authentic and it became something that really had life in it and a heart in it. And being here at the bike to school day is really demonstrating how when the students take it and make it their own idea. They're going to make a difference and so despite the COVID time I think this is a great event and very positive atmosphere.”

She further emphasized the need to invest in underserved communities:

“There's a lot of need to invest in this and get more investment to get more community groups to get more engineering support to make that happen.”

## Creating a High-Quality Learning Experience During COVID

Creating a high-quality learning experience during COVID times was definitely a challenge. All the sessions were held via zoom or Microsoft teams, depending on the schools' preferences. Creating a safe in person event with High School R emerged from student input and materialized in the form of a biking to school day and riding bikes to City hall to petition for more bike lanes and support of active transportation. The teachers expressed their satisfaction with overcoming COVID limitations.

“Doing big projects, it was hard this year with schools being closed and having to stay distant and so basically it was a natural fit to work on biking. It allowed us to get people together in a safe way.”

“It just it's a really fun thing to do like students haven't really gone in a while so it's definitely super fun to have an activity like this.”

## 4. Discussion

The qualitative data collected over the course of this project indicates that the FSTC is a high-quality educational experience that can engage underserved students and help them improve their communities.

The students became more aware of transportation related careers, and their comments indeed echo the findings in the literature, that they are typically not exposed to transportation related career options. Connecting these career options to meaningful issues that students care about (e.g. climate change, transportation equity) can be an effective way to reach students and increase the interest in transportation related careers.

The impact on higher level student learning was particularly evident through the interviews with students and teachers. The students not only learned content about transportation related topics and careers, but they actively engaged with the subject matter and developed skills in the areas of problem solving, collaboration, project management, critical thinking and action civics. The active engagement with the community and striving to create a positive impact on their immediate environment were evident.

The sustainability of the project is noteworthy, particularly as evidenced in teachers' future plans. The midterm outcome of continued engagement beyond the project timeline is very encouraging. High school R is going to organize a bike to school day and high school P is integrating transportation into their summer school program.

Overall, although challenged by COVID, this iteration of the FSTC remained an effective way to engage K–12 students in transportation related topics and connect them to university resources.

# Abbreviations and Acronyms

Please provide a list of all abbreviations/acronyms and their definitions. The template uses a table, which will be properly formatted during the publication process. Add additional rows as needed.

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FSTC	Fresno State Transportation Challenge
FSTI	Fresno State Transportation Institute

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Dr. Christian Wandeler is an associate professor in research methods and statistics at California State University, Fresno. He has a Ph.D. in personality and positive psychology from the University of Zurich, Switzerland. His research interests are the development of hope and learning achievement, project-based learning, and self-managing teams. He is currently researching the use of agile learning methods and design thinking in action civics projects. He is also a certified trainer of teachers in the eduScrum method.

## **Dr. Steven Hart**

Dr. Steven Hart is a full-time professor. He served as the principal investigator for a subgrantee award from the Learn and Serve “Civic Minor in Urban/Metropolitan Education” grant and co-principal investigator for the California State University Chancellor’s Office “Preparing a New Generation of Educators for California” grant. Dr. Hart is an expert in service-learning and served as the service-learning fellow at Fresno State. He engaged in participatory research with youth, exploring literacy practices in service-learning contexts developing afterschool programs with community centers, and implementing service-learning pedagogy with classroom teachers. Dr. Hart also led the management of a substantial grant from the California Public Charter Schools Grant Program as a board member of Kepler Neighborhood Charter School.

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